Implementation outcomes and population impact of a statewide information technology deployment for family caregivers: A mixed-methods study

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Abstract

Background: In 2022, the US Department of Health and Human Services delivered the first National Strategy to Support Family Caregivers, identifying actions for both government and the private sector. One of the major goals is to expand data, research, and evidence-based practices to support family caregivers. While information technologies are widely deployed in health care settings, they are rarely available at scale in community agencies. In 2019, California recognized the importance of a state-wide data base and a platform to serve caregivers virtually by enhancing service supports and investing in an on-line platform, CareNav™. Implementation commenced in early 2020 across eleven Caregiver Resource Centers covering all regions of the state of California.

Objective: This paper describes implementation strategies and outcomes of the state-wide implementation of CareNav™, an on-line platform to support family caregivers.

Methods: The Consolidated Framework for Implementation Research (CFIR), including a recent addendum, guided this mixed-methods evaluation. Two major approaches were used to evaluate the implementation process: in-depth qualitative interviews with key informants (n=82) and surveys of staff (n=112) and caregivers (n=2,229). We analyzed interview transcripts using qualitative descriptive methods then identified sub-themes and relationships among ideas, mapping the findings to the CFIR addendum and used descriptive statistics for surveys.

Results: We present findings about implementation strategies, implementation outcomes (i.e., adoption, fidelity and sustainment), and impact on population health (organizational effectiveness, equity, caregiver satisfaction, health and well-being). The platform was fully adopted within 18 months and the system is advancing towards sustainment through statewide collaboration. Deployment has progressed organizational effectiveness and quality, enhanced equity, and improved caregiver health and well-being.

Conclusions: This study provides a use case for technological implementation across a multi-site system with diverse community-based agencies. Future research can expand understanding of the barriers and facilitators of achieving relevant outcomes and population impact. Clinical Trial: N/A

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Key words: Online assessment, caregiver, technology implementation, CFIR, information technology

Introduction

Family caregiving is gaining visibility as an important public health issue with one in five families engaged in long-term care for older adults and disabled persons often without adequate resources and supports[1]. The complexity and intensity of caregiving for older adults and persons with disabilities is increasing, as the population ages and more individuals are living longer with challenges in physical, cognitive, and mental health. Caregivers enable family members and friends to live with chronic conditions in their environments of choice, assist with navigating acute health crises and hospitalizations, and provide comfort and support at the end of life. Over half of all family caregivers provide complex care including medical/nursing tasks previously performed in inpatient settings, delivering most of the care after discharge from hospitals[2]. State-level data reveals that in California, at least 4.4 million family caregivers assist individuals over the age of 18 years; of these caregivers, over half (56%) are employed while providing care. These individuals provide an estimated $81 billion worth of unpaid care each year in California[3].

Caregivers remain relatively invisible in the health care system, to their employers, and in their communities, yet they bear the brunt of delivering most of the long-term care for the aging population. Caregivers report lack of knowledge regarding the best caregiving practices, often learn how to deliver care on their own, and are worried about making mistakes[2]. Most caregivers are employed, but their income is often compromised by the caregiving role[3]. While family caregivers report positive aspects of caregiving, they also experience strain, depression, and loneliness, and they neglect their own health-related conditions because of the caregiving role[2]. There is evidence of health disparities in caregiving demands, supports and resources among diverse populations by race/ ethnicity and socioeconomic status[4]. Recent systematic reviews have concluded that caregivers require information and skills training, tools to improve coping with the physical and emotional burden of caregiving, paid and unpaid help, effective communication between caregiver and person in their care, and support to address barriers as they navigate the health care system[5,6].

In 2022, the Department of Health and Human Services delivered the first National Strategy to Support Family Caregivers, identifying actions for both government and the private sector[7]. One of the major goals is to expand data, research, and evidence-based practices to support family caregivers. While information technologies are widely deployed in health care settings, they are rarely available at scale in community-based agencies. Clinical settings use consumer-facing features such as secure internet portals that enable individual access to the electronic health record, secure e-mail messaging between the person and the healthcare provider, and internet-based resources for education, information, advice and peer support[8]. Information technology tools could be highly beneficial for caregiver assessment, service delivery, and evaluation of a broad range of interventions, increasing access and convenience. To date, most projects examining innovative technology tools focus on feasibility and acceptance with studies of limited sample size[9-11].

Recognizing the importance of a state-wide database and a platform to serve caregivers virtually, in 2019, the California Department of Health and Community Services (DHCS) invested in an on-line platform, CareNav™ across an existing support network, the California Caregiver Resource Center (CRC) system. Launched in 1984 by the Comprehensive Act for Families and Caregivers of Brain-Impaired Adults to support caregivers and care recipients, the CRC system includes eleven sites with catchment areas covering the entire state. The proprietary software platform CareNav™ was developed by the San Francisco Bay Area CRC, Family Caregiver Alliance (FCA) in collaboration with software developer, Quality Processing[12]. CareNav™ is an online platform that enables interactive standardized caregiver assessment, an online record of client information and encounters, secure communications, and the ability to create a care plan and tailored information and resource content. Clients may either complete the assessment online or by contacting a staff person who administers and records the assessment. The system includes administrative functionality including tracking service authorization and contracts, aggregate profiles, and management reports on staff activities.

DHCS committed to funding expanded caregiver services and deployment of CareNav™ over 3 years (2019-2022). Led by FCA, statewide CareNav™ implementation included related training for all CRC sites on platform use, data quality improvement, and change management. The UC Davis Family Caregiving Institute was engaged to evaluate the implementation process.

The Consolidated Framework for Implementation Research (CFIR) guided our evaluation[13]. A recent addendum to the CFIR went beyond evaluating the outer setting, the inner setting, the intervention characteristics, staff characteristics, and the process of implementation, by augmenting the original model with implementation outcomes and population impact[14]. The Dynamic Sustainability Framework[15] informed interpretation of sustainability of implementation outcomes. The conceptual model for this study incorporated both the CFIR Addendum and the Dynamic Sustainability Framework, adapted from the work of Damschroder et al[14] and Chambers et al[15] and is depicted in Figure 1.

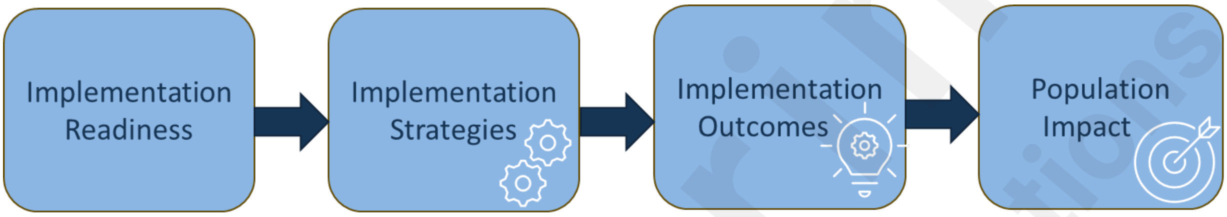


Figure 1: CFIR Outcomes Addendum

We previously published findings on baseline implementation readiness[16]. These early findings indicated that leadership, communication, harmonization of processes across sites, and motivation to serve clients using technology were critical elements of success. This paper focuses on the trajectory of implementation readiness, implementation strategies, and population impact after initial statewide implementation of a web-based interactive resource information technology/platform supporting standardized caregiver assessment and provision of tailored resources (CareNav™) in the eleven California Caregiver Resource Centers (CRCs).

Methods

We used a mixed methods sequential triangulation design to examine the implementation process and outcomes including focused interviews with CRC staff and leaders and surveys of both staff and caregiver clients. To protect human subjects, the study was approved by the University of California, Davis Institutional Review Board.

Recruitment

We recruited participants from the eleven CRC sites. For focused interviews, we sent an e-mail invitation to all leaders and clinical staff and to the implementation team. All current leaders and staff of the 11 CRCs were eligible to participate in the focus group interviews. For the staff survey, we sent e-mail invitations to all staff of the CRCs to complete Qualtrics interviews. For caregiver surveys, sites distributed surveys quarterly to all caregivers served in the past quarter, in both electronic and paper form.

Focused interviews

We conducted separate focus group interviews at each site with leaders and staff (a total of 22 focus groups) and interviewed two key informants from the implementation team. After obtaining consent to participate and to be recorded. we used a semi-structured interview guide to explore the

CareNav™ implementation process, challenges and facilitators, anticipated system and client outcomes, satisfaction with the process, and training activities. Interviews were conducted over Zoom in March and April 2022 and audio recorded. The interviews ranged from 45 to 60 minutes.

Surveys

The *Readiness Survey*[16] is a 17-item tool assessing staff preparation and confidence regarding the implementation process and self-efficacy using a 5-point scale (1 represents the most negative and 5 the most positive response). The Readiness Survey also assessed knowledge about CareNav™, caregiver support to use CareNav™, and implementation outcomes encompassing CareNav™ adoption and developmental phases (fidelity). Items addressing developmental phases rated current CareNav™ utilization and willingness to expand CareNav™ utilization according to functionalities previously identified in the focused interviews. Open-ended questions identified benefits and concerns about CareNav™, and suggestions for improvement. The survey was administered between July and September 2023.

The *Caregiver Satisfaction Survey* assessed satisfaction with services, confidence in caregiving, knowledge, caregiver stress, and experiences with the online platform and technology. The surveys included items rated on a five-point scale, where 5 represents the most positive response. The survey also invited comments from caregivers in an open-ended format. All caregivers who encountered the CRCs during the year (between July 2022 and June 2023) were invited to complete a Satisfaction Survey. Surveys were anonymous and we did not collect demographic data.

Data Analysis

The recordings of the focus group interviews were transcribed, audited, then imported into Dedoose qualitative data analysis software. We used qualitative descriptive methods to analyze the transcripts and open-ended responses to the surveys [17,18] and established a three-phase protocol for analysis. In the first phase, three members of the research team reviewed the transcripts and developed initial codes and definitions. In the second phase, two team members coded the transcripts, meeting weekly with the third member to discuss coding decisions, refine code definitions, reach consensus about the coding, and identify themes, sub-themes, and relationships among ideas. In the third phase, we mapped the themes to the CFIR Addendum and Dynamic Sustainability Frameworks. We documented analysis notes, codes, and refinements in an audit trail.

Quantitative data from both surveys were analyzed using IBM SPSS statistical package version 27 to generate descriptive statistics. Mixed methods data analysis was performed after completion of separate analyses of the survey and focused interview data. During this phase, we integrated quantitative and qualitative results and interpreted the findings in relation to the CFIR Addendum and Dynamic Sustainability Frameworks.

Results

Participants

Across 11 CRC sites, 80 CRC staff members (43 clinical staff (family consultants/ social workers), 10 administrative support staff members) and 27 leaders (directors, clinical directors, managers) participated in 22 focus groups with between 2 and 15 participants per site. In addition, we conducted two individual interviews with key implementation team informants.

For the Readiness Survey, there were 118 staff responses. Of them, 112 (94.9%) completed at least 75% of the Readiness Survey responses, and 105 submitted a demographic survey. Most participating staff members served in clinical roles (n=70, 62.5%) and the remaining were in administrative roles. All samples were diverse across age and racial identity, with most participants being female. Demographic characteristics of the samples are included in Table 1.

For the Caregiver Satisfaction Survey, 2,229 participants responded. We did not collect demographic data in these anonymous surveys. In addition to responding to the survey items, caregivers were invited to make comments about the services. Caregivers provided 1,210 comments about the services. Forty comments were provided in Spanish.

Table 1: Demographic characteristics of Staff Participating in Focused interviews and Readiness Surveys

Participant characteristics, n (%)	*Interviews (n = 82)*	*Readiness Survey (n = 105)**
Age		
25 or under	8 (9.8)	1 (1.0)
26-35	30 (36.6)	39 (37.1)
36-45	11 (13.4)	27 (25.7)
46-55	12 (14.6)	11 (10.5)
56-65	11 (13.4)	13 (12.4)
Over 65	4 (4.9)	6 (5.7)
Decline to answer	6 (7.3)	8 (7.6)
Gender		
Female	60 (73.2)	85 (81.0)
Male	16 (19.5)	13 (12.4)
Other	1 (1.2)	3 (2.9)
Decline to answer	5 (6.1)	4 (3.8)
Racial identity†		
African American/Black	4 (4.9)	5 (4.8)
Asian/Pacific Islander	12 (14.6)	17 (16.2)
Hispanic/Latino	34 (41.5)	39 (37.1)
Native American	2 (2.4)	2 (1.9)
White or Caucasian	30 (36.6)	37 (35.2)
Other	1 (1.2)	2 (1.9)
Decline to answer	5 (6.1)	10 (9.6)

** Of the 118 survey respondents, 105 demographic surveys were submitted.*
†Percentages may not add to 100 due to multiple racial identities

We present survey results and major themes from the qualitative data that reflect major components of our conceptual model: implementation readiness, implementation strategies, implementation outcomes, and population impact.

Implementation readiness

We assessed implementation readiness of staff with the Readiness Survey. Overall, participants had very positive attitudes toward implementation of CareNav™, with a total readiness score 4.3 (0.5) on a scale of 1 to 5 where 5 is the most positive. Average responses to all items were in the positive range ().

Table 2: Readiness Survey three years after implementation launch (n=112)

Item	**Mean (SD)**
Knowledge and beliefs about CareNav™	
CareNav™ improves the ability to record services	4.4 (0.8)
CareNav™ provides tailored and accessible information for caregivers	3.8 (1.0)[1]
Clients should be given a range of service delivery options to ensure they select one that works best for them	4.8 (0.5)

Self-efficacy	
Prepared to use CareNav™	4.3 (0.7)[1]
Confident to use CareNav™	4.4 (0.7)
Capable to use CareNav™	4.5 (0.7)[1]
Readiness for change	
Positive with the expansion of CRC services	4.4 (0.8)[2]
Positive with using CareNav™	4.1 (0.9)[1]
Willing to do new things	4.4 (0.7)
Know where to obtain help	3.5 (1.3)
Total readiness score	4.3 (0.5)
[1]n=111 ; [2]n=109	

Implementation strategies

The implementation process entailed iterative, continuous, and long-term activities using real-time analysis of client data with adaptation and refinement. Focus group participants and key informants describe three main strategies employed: data harmonization and quality, training and technical support, and group learning. Figure 2 summarizes implementation strategies.

Figure 2: Implementation Strategies

Data harmonization and quality

The goal of creating a state-wide database and service management system carried several important assumptions, including standardizing the assessment, adopting common workflows around services and referrals, and agreeing to shared metrics for success. CRC site staff and the Quality Process technology team engaged in data harmonization and quality, facilitated by the UC Davis evaluation team. During the early part of the project, the design team engaged in deep learning at each site to understand the local conditions and to map the technology implementation path. The overall approach to initial deployment was to optimize the common elements and to minimize customization. The philosophy of designing and scaling CareNav™ necessitated balancing the unique data collection and integration needs of each site, with the goal of creating a state-level decision support and resource provision system to expand services for California caregivers. Thoughtful decisions were made regarding the extent of site-level flexibility that the system could support for each CareNav™ feature without compromising uniformity.

The evaluation team conducted extensive analysis of CareNav™ data--including variables collected at intake, assessment, reassessment—providing rapid-cycle feedback to the CRC sites when data discrepancies were identified. The evaluation team also raised issues around data quality and integrity to the CRC directors and clinical directors for discussion and consensus building. Implementation involved data harmonization, integration of data sources and structures from the 11 sites, requiring processes to ensure data quality and consistency. There were two major issues in implementation of a standardized assessment: mapping previous data to the appropriate fields in CareNav^{TM} and coming to consensus on variable definitions, in reconciling diverse interpretations of specific data points.

Several threats to data quality had to be resolved through consensus building. First, staff held diverse beliefs about data accuracy and quality leading to different practices in collection and entry. For example, staff varied in how they conducted and recorded assessments, ranging from consultants administering the standardized assessment. completing data fields in a systematic way, to consultants using the standardized assessment as a general guide for conversation, then later entering their interpretation of the client's narrative as data. In one site, consultants conducted guided interviews, then another staff member entered the data. Data integrity was further threatened as staff interpreted the meaning of data fields differently and subsequently recorded with that bias. These issues were compounded when staff conducted the interviews in languages other than English (the only language currently supported by CareNav^{TM}), then translated and entered data. Complex concepts, such as spirituality or loneliness carry different cultural meanings and are subject to linguistic inaccuracy across translation. Finally, site leaders varied in their commitment to assuring data quality and in their ability to provide guidance to their teams to achieve consensus and accuracy.

Training and technical support

Technology deployment requires extensive training and technical support. Users begin with different levels of technical and data understanding, so leaders must customize training to establish shared foundational knowledge and skills and to address site and person-specific learning needs. Furthermore, CareNav^{TM} features a client portal, necessitating preparation of caregivers both in general digital access and specific coaching to use the program. The implementation team advanced training and support in several ways, with site-specific education sessions, statewide web-based training, site and individual technical support, and assisting staff to support caregivers.

Group learning

The statewide deployment of CareNav ^{TM} offered the CRC sites new opportunities for collaboration and group learning. Several subgroups formed, including those focused on clinical, leadership, and data management issues. Within these subgroups, members across the state engaged with one another in lessons learned and shared educational materials and best practices among the sites. A state-wide education committee formed to identify and develop collective resources, both for the staff and clients. The collective also focused on cross-site marketing efforts, including a central website with links to all sites, enhancing general visibility of caregiver resources and enhancing the ability of clients to find the appropriate support.

Implementation outcomes

Implementation outcomes (adoption, fidelity and sustainment) were assessed using qualitative and survey data gathered from staff and clients. Figure 3 summarizes the main themes encompassing implementation outcomes.

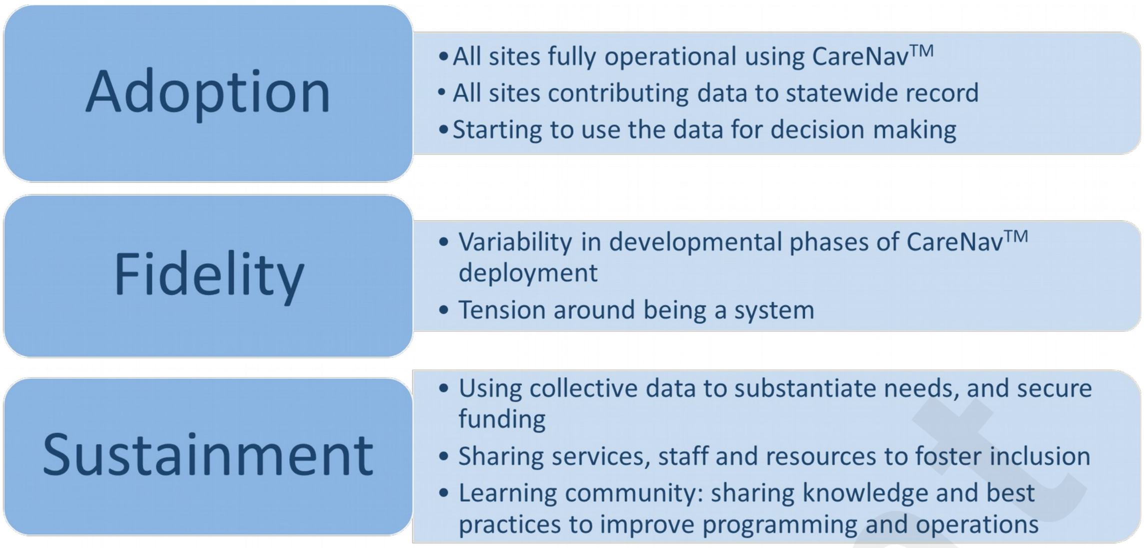


Figure 3: Implementation Outcomes

Adoption

By fiscal year 2021-2022 (two years after launching CareNav™ in all CRC sites) all CRCs had adopted the new platform and were fully operational, using CareNav™ and contributing data to the state-wide record. A year later, in 2023, most of the staff survey participants (n=101, 90.1%) agree (somewhat or strongly) that everyone on staff regularly uses CareNav™.

CareNav™ Functionality

Participants described the most significant features of CareNav™: the standardized assessment, reports, and the client portal. The CRC sites use these CareNav™ features for two primary purposes: as client records to facilitate serving individual clients and for consultant or site-level management of the client population. Table 3 summarizes CareNav™ features, and their utilization followed by more detailed description.

The most common and universal use of CareNav™ is for client data collection purposes. The sites described the advantages of having streamlined longitudinal records, accessible in real time, including reports of home visits. CareNav™ provides ready access across staff to relevant fields and facilitates continuity of client service and support, as well as case management along the service trajectory.

CareNav™ also improves team capability, facilitating care coordination among staff members, streamlining client communication and building trust. Clinical directors and administrators use aggregate client data to manage and assign caseloads for staff and guide outreach and program planning priorities. At the system level, standardized data collection has enabled the first-ever comprehensive view of caregiver needs in California, populations served, comparison of clients to other caregivers in state or national databases, and service provision. CRC directors identify the power of this information to guide strategy, resource allocation and policy.

> *"One of the things I love as a director, is how we can look at the data and what we can do with the data, […] I'm able to look at our numbers and look at sort of our demographics, look at the profile of who we're serving, and I've been able to take that information and talk to county funders about […] who are the caregivers in […] County that your funding has to serve? […] We were able […] to look at the difference between what's going on with our folks in rural areas and what's going on in non-rural areas. And it was a surprise to people that, it's the same*

> *[…]. And that was really awesome, because we were expecting our rural folks to be faring probably, I think worse because they were more isolated […]. So we can use that internally as well. […] And we looked at […] our need to be more accessible to our diverse populations. […] I was able to […] look at […] some of our rural areas, and […] we haven't really served our Indian population, our tribal communities, as well as I think that we should.” (Director)*

Table 3: CareNav™ design components and functionality

CareNav™ features			
Functionality	*Standardized Assessment*	*Report Generation*	*Client Portal*
Client-level			
Client records	Data collection Service history	Client utilization Online resource use	Self-administration of intake/assessment
Case management and decision support	Access to client records for all staff on the team	Aggregate client data, units of service	Messaging clients, assigning resources
Staff-client interaction, service provision	Generating tailored resources	Client engagement, units of service	Asynchronous access and communication
Consultant, Site- and System-level			
Caseload management to support efficiency	Navigation features (search, sort, filter)	Clinical staff caseload	
Outreach and Diversity, Equity and Inclusion (DEI)	Ease of access for diverse clients	Outreach and service for target populations	Convenient access to services
State-level planning	Aggregate summary of client needs	Populations served, service provision	

The *client portal* is a major innovation for CRC service delivery, providing clients with continuous access to the CRCs to post queries, complete assessments, review tailored resources, receive service vouchers, and communicate with CRC clinical staff asynchronously. Adoption of this feature is a multi-faceted process requiring clinical staff and client involvement. The clinical staff report that some clients prefer self-administration of the intake and assessment as it is faster and more convenient than an interview, while others prefer engaging with staff for the assessment. CRC clients report that they appreciate the convenience of choosing a time to complete the assessment, the privacy compared to speaking on a phone, and the ability to complete part of the assessment and return later.

> *“We appreciate having the access to be able to do the assessment and the reassessment online and to be able to compare especially […] an old reassessment to what we're doing now, so you can see side by side, […] so I can see the changes and that helps generate a little bit more conversation […]. if we see a bigger change, […] we can have that conversation of what happened, how has that impacted you as a caregiver? And […] being able to offer a little bit different resources, then maybe […] I wouldn't have been able to do before, just because I wasn't able to see the change…” (Staff)*

The client Satisfaction Survey collected information about caregiver experiences with the online platform. Of the 2,125 respondents, most were offered online services (82%) and a quarter of caregiver respondents (25%) indicated having used the CareNav™ system. Most caregivers who used CareNav™ were satisfied with the experience (extremely satisfied, 50% and somewhat satisfied, 33%). Those who did not use CareNav™ were asked about the reasons for not engaging with the online program. The largest barrier to use was awareness about the program (31%), followed by the impression that the caregiver did not need this (19%) and lack of technology experience (14%). Access to internet (4%) and finding the platform too confusing (2%) were minimal barriers.

Staff at sites offer varied levels of expertise and motivation in supporting clients, with some unable or unwilling to provide the necessary technological support and education to enable client self-administration. Some sites took a proactive approach, having a dedicated staff person to monitor clients who start a record and reach out to offer support, and to send invitations to sign up and complete the on-line intake form before an appointment with a family consultant. A third (31%) of the clinical support staff in the survey reported encouraging clients to access CareNav™ through the portal.

Fidelity

Site-level analysis of CareNav™ utilization revealed that while all CRC sites now use CareNav™ for daily operations, individual sites represent different dynamic stages of operational integration of CareNav™, outreach approaches and expansion of services, and diversity, equity, and inclusion efforts. The sites were categorized as early phase or moderate to advanced phase for each of the six dimensions. We categorized sites as early phase if they focused on more technical, basic and passive actions and as more advanced when they presented a more strategic approach, and more utilization of data and outcome-oriented operations. Table 5 depicts the developmental phases of implementation of the platform across the eleven sites. As can be seen in this tableError: Reference source not found, sites are in different phases of implementation depending on the dimension, with one site operating at an advanced level across all and one site at an early level across all dimensions. The sites have begun using data to create strategy for outreach and to optimize diversity, equity and inclusion, with room for growth in these areas.

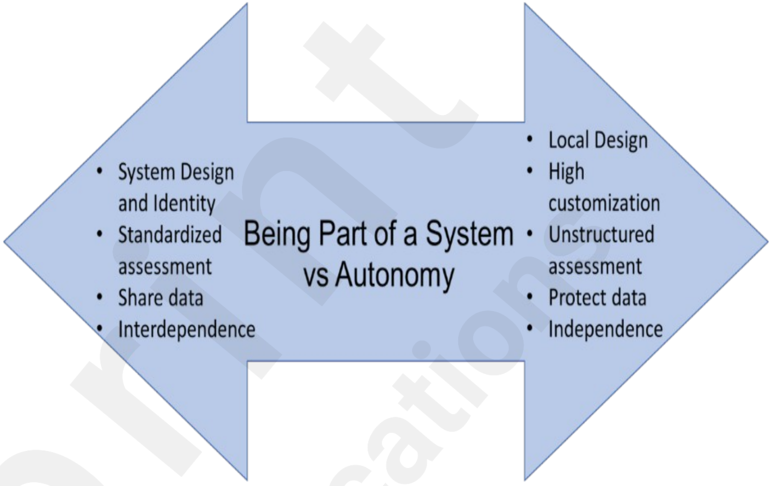
> *"Learning a new system. It just requires […] time and patience and flexibility. And one thing came up […] about CareNav™ in particular. […] there's a lot of functionality built into it. We can do a lot of things with CareNav™. And so right now we're doing, maybe we're only using a certain percentage of all of the tools that are built into it, and really learning how."* (Staff)

Table 4: Fidelity: Developmental phases of implementation

Dimension	*Developmental phase description*		*Site-level developmental phase (n sites=11)*											
	Early	*Moderate to Advanced*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*n (%) sites Moderate-advanced*
CareNav™ Functionality	Client-level: data collection and documentation	Client level: case management and decision support; consultant, site- and system-level: caseload management		▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	10 (90.9)
CareNav™ Feature: Standardized Assessment	Asynchronous and selected fields; dedicated tech staff entering paper data	Synchronous, comprehensive data collection; staff or clients enter electronic data in real time		▨			▨	▨	▨		▨		▨	5 (45.5)
CareNav™ Feature: Report Generation	Predefined templates for reports	Flexible reports run by sites as needed; use reports for decision support		▨		▨	▨	▨	▨			▨		6 (54.5)
CareNav™ Feature: Client Portal	Passive approach	Active approach: staff encourage and support clients to use client Portal		▨	▨	▨				▨	▨		▨	6 (54.5)
Outreach Approach	Historical relationships and referral	Using data to guide and evaluate selective outreach		▨							▨		▨	3 (27.2)
Diversity, Equity, Inclusion	Translation of materials, focus on specific local ethnic groups	Broad definition of diversity (race/ ethnicity, geography, LGBTQ, income) and using data to identify opportunities for inclusion		▨			▨			▨	▨	▨		5 (45.5)

Developmental phases were shaped by the baseline systems in place at each site and their unique local conditions and relationships. A major interview theme related to developmental phase was how each site weighed the benefits of incorporation into the CCRC system alongside the benefits of autonomy as an individual CRC (see Error: Reference source not found). For a few sites, CareNav™ implementation involved a shift in service philosophy, in addition to implementing new technology. For example, this shift triggered a tension between a professional philosophy valuing open-ended interviewing vs. standardization of the intake and assessment processes, an important feature of incorporation into a larger system with a uniform database. Most of the tension around being a system centered on standardized assessment, coupled with the ability to customize reports to meet local needs. This tension was most acute when a site had a previous data management system in place, requiring adaptation and harmonization. Another area of tension related to the extent to which sites are proactive in reaching the population of the region vs. being more reactive and relying on established referral sources. As a system with a commitment to expand services, advanced sites are using data to identify unmet needs in the region and designing strategies to connect with underserved communities and to tailor programs to meet cultural and linguistic requirements. Furthermore, they are collaborating with one another to leverage resources across regions.

Figure 4: Tension: Being Part of a System vs. Autonomy



The Readiness Survey results illustrate the overall extent to which CRC staff and leadership integrated CareNav™ and service expansion dimensions in their operations and their future plans. The most positive items (means = 4.3, SD = 1.0) were using CareNav™ to guide assessments and enter data in real time and desiring to expand use of the platform. The lowest rated item was encouraging clients to use the portal (mean = 3.1, SD = 1.2). Most of the participants with clinical support roles (n=56, 80%) used CareNav™ to guide assessments and enter data in real time and two-thirds (n=43, 61%) would like to expand use of CareNav™ to coordinate client support. Only a third (n=23, 33%) of clinical staff agree that they encourage clients to access CareNav™ through the portal.

Half of the participants with administrative roles (n=23, 56%) used CareNav™ for decision making regarding the CRC site and its programs (e.g., targeted outreach, program offerings) and two-thirds (n=30, 73%) were willing to expand the use of CareNav™ (e.g., generating new reports, using data for program improvement, making decisions). Two-thirds of participants (n=69, 62%) used CareNav™ data to understand the needs of diverse clients (e.g., in terms of race/ethnicity, geography, sexual orientation, gender identity, income). They reported using these data to implement various strategies, including collecting demographic data, targeting grant funding and outreach based on a comparison between intake data and census demographics, improving linguistic access, staff training and expanding of resources available in CareNav™.

Sustainment

Focused interview participants highlighted having a shared identity and mission, sharing data and collaborating as critical elements to actualize the potential of a system of delivery for California's caregivers and to promote sustainability. The most commonly discussed system outcome was the statewide identity across the sites that has created various opportunities for current and future partnership. Several express pride in being part of a system that is a model for the nation and has a goal to support all caregivers in California. Both staff and leadership identified the creation of new structures supporting long term collaboration between sites and use of the CareNav ™ statewide comprehensive database as a path to sustainability. They recognize the power of working together and using their collective data to better serve clients, to substantiate client care needs toward the goal of securing funding for sustainability.

CRC leaders also identify system-level outcomes that benefit clients directly. They recognize the potential of shared services, staff, and resources to foster greater inclusion across race/ethnicity and language groups. This has particular impact for service to smaller or more geographically dispersed populations. The state-wide shared calendar of virtual events is the prime example of wide and efficient dissemination of useful culturally and linguistically appropriate resources across the entire state.

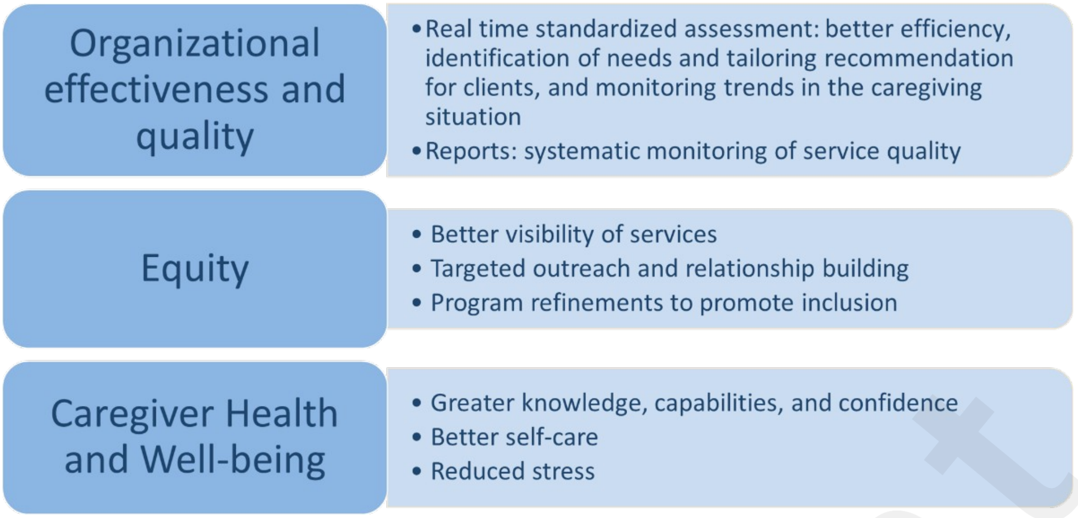
The CRC leaders have formed a learning community with one another, sharing best practices and knowledge to improve the quality of their programming and operations. Directors and clinical directors have developed system-wide clinical policies and engaged in cross-site marketing efforts. Several statewide meetings are occurring that build collective momentum, including directors, clinical directors, supervisors, and education coordinators. The statewide education committee enriches site-level effectiveness as well as creating shared resources.

> *“Since we've gone forward with CareNav™, our entire Caregiver Resource Center system has really gone through a massive enhancement. And I think a lot of it is the work that the directors and the staff have done. So we're getting together on a regular basis. We're meeting. We are developing, you know, policies with the clinical side, the staff, they're getting together and they're coming up with policies. We've created a marketing campaign. Through Zoom, we're now sharing education events statewide and collecting data statewide. So again, CareNav™ is critical tool. But I think the driving force behind everything has been this kind of movement of the Caregiver Resource Centers coming back together, working with lobbyists, legislators, leveraging money to come in and support our efforts.”* (Director)

Population Impact

The impact on the population manifested in three major ways: achieving organizational effectiveness and quality, promoting equity, and enhancing caregiver health and well-being. Figure 5 depicts population impact.

Figure 5: Population Impact



Organizational effectiveness and quality	• Real time standardized assessment: better efficiency, identification of needs and tailoring recommendation for clients, and monitoring trends in the caregiving situation • Reports: systematic monitoring of service quality
Equity	• Better visibility of services • Targeted outreach and relationship building • Program refinements to promote inclusion
Caregiver Health and Well-being	• Greater knowledge, capabilities, and confidence • Better self-care • Reduced stress

Organizational effectiveness and quality

Leaders described greater operational effectiveness, responsiveness and improved quality of services. The real-time standardized assessment assured better identification of needs and tailoring recommendations for clients. With documentation of repeat encounters, staff were able to monitor the caregiving trajectory and augment resources as they became needed. The online platform enabled better communication among staff and greater efficiency in serving clients as a team. Site leaders valued the ability to monitor the quality of service and to use data to guide decision making around staff assignments and program priorities. The client portal facilitated timely and consistent communication with clients at convenient times for them as well as a central repository of individualized resources and services.

The most reported impact of CareNav™ on serving clients was the ability to provide more resources for more people in a faster and more convenient way. Many staff noted improved client-provider relationships because CareNav™ allows a transparent means to provide services, accessible to both staff and client, shifting to a more collaborative relationship. The virtual messaging tools enable timely and consistent communication. Web-based statewide resources provide more options to clients than a small regional program can offer, providing more opportunities for caregivers to attend educational and support group resources, from any site.

Equity

CareNav™ promotes equity by targeted sub-group analysis to better understand the experiences and priorities of diverse caregivers, enabling more thoughtful tailoring of both outreach and programs. The aggregate profiles of clients served by each CRC provided information about the reach of the programs and the gaps in service for sub-populations in the region. Synthesis of the data identifies opportunities for developing new partnerships in the community to promote visibility to and acceptability for underserved caregivers. The data also provide guidance for strategic planning around program enhancement to achieve cultural congruence and to promote inclusion. Leaders have forged new shared services, staff, and resources to foster inclusion. A statewide shared calendar of virtual events such as educational resources in various languages, increasing access for all regions. Several sites have collaborated to match staff members to the regional linguistic diversity, enabling provision of consultation in the preferred language of the caregiver. Some staff expressed concern about the digital divide disproportionately affecting certain client populations because of cost, internet access or technological literacy. To accomplish digital equity, staff recognize that full client engagement will require further tools and education to prepare clients to use the CareNav™ platform.

Caregiver Health and Well-being

All parties identified benefits for caregivers including improved health and well-being. Specifically, clients appreciate having a centralized resource that records precise identification of both care recipient and caregiver needs, coupled with tailored resources. Overall, staff report that CareNav™ has improved their ability to identify and respond to client needs and has changed the way they engage with clients.

> *"…that [the results of the assessment] gives you room to have a conversation […]. No wonder you're feeling so overwhelmed. Look at, this is what you just told us. We're not guessing you're overwhelmed. You just told us you were overwhelmed, right, by answering these questions in that way. So, having the questions you ask in CareNav™, sort of be the structure for that, the clinical interview, […], but taking that information and using it for developing the care plan […]. You said you don't have your financial […] documents in order, so […] perhaps that should be on your care plan, right? Is that something that you can commit to do? […] you're feeling overwhelmed and isolated, perhaps one of our support groups might work, right? […] what we ask in the assessment tells you, sort of, informs the conversation with the client."* (Staff)

Caregivers, staff and leadership highlighted the positive impact on caregiver health and well-being. The assessment followed by a tailored care plan prioritizing the most pressing concerns resulted in positive outcomes for clients. Caregivers reported gaining confidence, knowledge and awareness of community resources, better understanding of the care recipient's situation and better ability to manage the care. As one of the clients described:

> *"The family consultant is such a valuable resource... Helping us to connect to different resources, helping us to remember [that] we, as caregivers, shouldn't forget to take care of our mental, emotional, and physical well-being. I am grateful they can help us to organize and make a plan to help ourselves to be there for our care receivers."* (Caregiver)

The Caregiver Satisfaction Survey explored the impact of CareNav™ and services on the lives of the caregivers, with mean scores displayed in Error: Reference source not found. Scores range from 1 (Strongly Disagree) to 5 (Strongly Agree) with 5 indicating the most positive impact. The results indicate strong impact in confidence, ability to manage care, increased in knowledge and awareness, better access community resources, understanding of the disease/disability and issues, improved self-care for their physical and mental health, and reduction in feelings of stress.

Table 5: Caregiver satisfaction Surveys: impact of CareNav™ and the services on caregiver (n = 2,254)

Item	*Mean*
More Confident as a Caregiver	4.2 (0.8)
Better Able to Manage Care	4.2 (0.8)
More Knowledge and Awareness	4.3 (0.8)
Understand the Disease/Disability/Problem Better	4.1 (0.9)
Taking Better Care of Self	4.1 (0.9)
Less Stressed	3.9 (1.0)

Discussion

This paper described a rigorous evaluation of a complex implementation of a state-wide online platform to enhance services to family caregivers. The CFIR Addendum and Dynamic Sustainability Frameworks provided a useful approach to explore cross-site variability and driving forces for implementation and sustainability. A deeper consideration of outcomes can drive meaningful evaluation, to include both implementation and innovation outcomes and consideration of indicators of sustainability and impact on the population served[19].

Implementation of CareNav™ occurred during a unique time in history, with rapid advances in technology in all sectors of society, changing expectations by caregivers as younger generations assume this role, as well as a global pandemic. In many ways, these forces accelerated and aided the implementation process. In other ways, these collective changes deepened the divide between those who accept and embrace change and those who prefer to retain the status quo. Early implementation findings suggested that some sites, particularly those embedded within larger health systems, experienced a tension between harmonizing workflows with the other CRC sites while also retaining compatibility with the workflows and technologies of partner organizations[16].

Although tension around adapting individual site workflows remained a theme in this longitudinal view of implementation, site-specific technology support and training helped in addressing logistical barriers and group learning provided opportunities to build consensus around which modifications were most important. With the complexity of CRC operations, from client engagement to outreach to creating business efficiencies, it is not surprising that sites manifest variable patterns of implementation phases across CareNav™ and services expansion dimensions. As has been suggested previously[20], local contextual factors drive the priority of various strategies to accomplish implementation, an observation amplified across the eleven sites in this evaluation. The variability of developmental implementation patterns and the tendency to focus on individual client data before more advanced analytical processes provide evidence for a non-linear implementation course of a multi-component health information technology adoption across a diverse network, common for healthcare organizations. It was helpful to the evaluation to establish developmental phases of implementation to consider both site-specific attainment of minimal progress and overall evolution.

Leaders of this initiative used an iterative, continuous and long-term implementation strategy that advanced full adoption of CareNav in daily operations. The effort was accelerated by providing appropriate training and technical support and fostering a learning community. The relatively high scores we identified across items on the Readiness Survey persisted over time, suggesting that these support efforts have helped to prepare CRC staff effectively for implementation and ongoing operations.

Client adoption rates of around 25% exceeded reported rates of patient portal adoption in healthcare systems. In a study in the Netherlands, 20% of older adults who were hospitalized activated a patient portal account. The participation rate declined with age, with about 50% more patients over 76 years of age declining to create an account than those who activated their account[21]. Similarly, in a community-based sample of low income, ethnically diverse patients seen in a rural clinic, 20.5% reported using their patient portal, with greater odds of engagement for those having higher education and social support coupled with frequent internet use[22]. In the case of CareNav™, the most important barrier was lack of awareness of the opportunity to use an online portal. This finding contrasts with a systematic review of patient portal and electronic personal health record use, where the major barriers were privacy and security, access to the internet and ability to use technology[23]. Together these findings suggest that caregiver clients are using the system at a level slightly higher than health system portals, and that increasing awareness could be the most important strategy to increase engagement.

The CareNav™ implementation process fostered statewide system identity and created structures that had a significant role in promoting sustainability of the implementation. Future efforts should focus on achieving sustainment and realizing population impact. Data-driven strategic decisions have the potential to realize operational efficiencies while prioritizing the most effective efforts of staff. The system has potential to support documentation of population impact and cost effectiveness as a persuasive strategy to procure sustainable funding for vital programs. Going forward, with a goal of achieving advanced implementation across all sites, training and technical support could focus more attention on enhancing site and system level functions, and optimal use of data to drive both client level and system level decisions and priorities.

Based on data about the population served and gaps in program offerings, both staff and leaders articulated the need for broader cultural adaptation of the service model for specific communities, including linguistic translation of assessment and educational material. Beyond language, several CRC leaders and staff recognized the importance of a broader cultural adaptation approach for specific communities, for example, caregivers from tribal communities, under resourced racial/ethnic groups, the LGBTQ+ community and rural settings to assure congruence of programming with client needs and to advance equity. Several leaders cited the dearth of evidence about the best approaches to serve certain underrepresented communities and shared the hope that evaluation of their efforts will contribute to this important knowledge base.

For clients, digital equity occurs at multiple levels, from availability of internet service in certain communities, to affordability of service as well as technological literacy. CRC staff play a vital role in encouraging clients to use the online program and providing technical support as they navigate the system, and some sites are more effective at promoting online engagement than others. Full deployment requires overcoming these barriers and assuring access to all caregivers who desire to participate in this way.

Limitations of this study included reliance on self-report from staff and caregivers regarding implementation progress. This limitation was partially offset by triangulation of actual data entered into CareNav^{TM} that was analyzed by the evaluation team to identify quality and integrity issues. With the iterative process of engagement among the evaluation team and the sites implementing the program, we were able to identify progress and barriers associated with implementation in real time. The implementation occurred in one state that is more diverse demographically than many states, limiting generalizability to all states, but providing valuable information related to equity.

The study identified individual and site-level factors related to the CareNav^{TM} implementation process. Future longitudinal studies should explore long-term adoption trajectories to inform continuous implementation planning, particularly to guide implementation efforts in complex health or social care systems, where one size does not fit all. Further research could examine longer term outcomes, particularly in the areas of impact on clients served. Finally, the question of the extent to which automating social service processes and the use of artificial intelligence expands capacity is a vital consideration with the growth of the older adult population and the need for new solutions to increase capacity.

While electronic records are common in health systems and in a variety of industries, community-based agencies have lagged behind in adoption. Advancement in technology in this sector is essential to realize integration of health and social services for the betterment of population health and to address growing demand for services. The results of the efforts of the California Caregiver Resource Centers provide a compelling use case for successful implementation and adoption of technology in community-based agencies. Going forward, the California CRCs will grapple with important questions about being a system, advancing technological capacity for clients and staff, and solving vital equity issues to get services and supports to all caregivers in need.

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Conflicts of Interest
The authors do not have any competing interests to disclose.

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Abbreviations:

CFIR: Consolidated Framework for Implementation Research
CRC: Caregiver Resource Center
DHCS: Department of Health and Community Services
FCA: Family Caregiver Alliance

Supplementary Files

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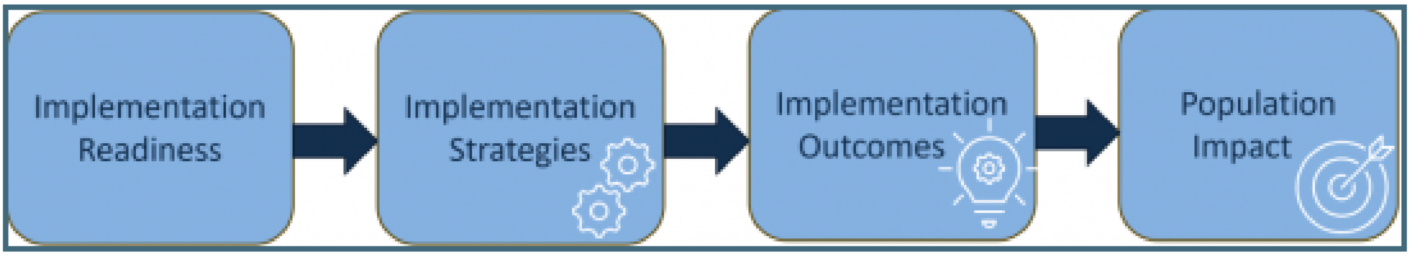
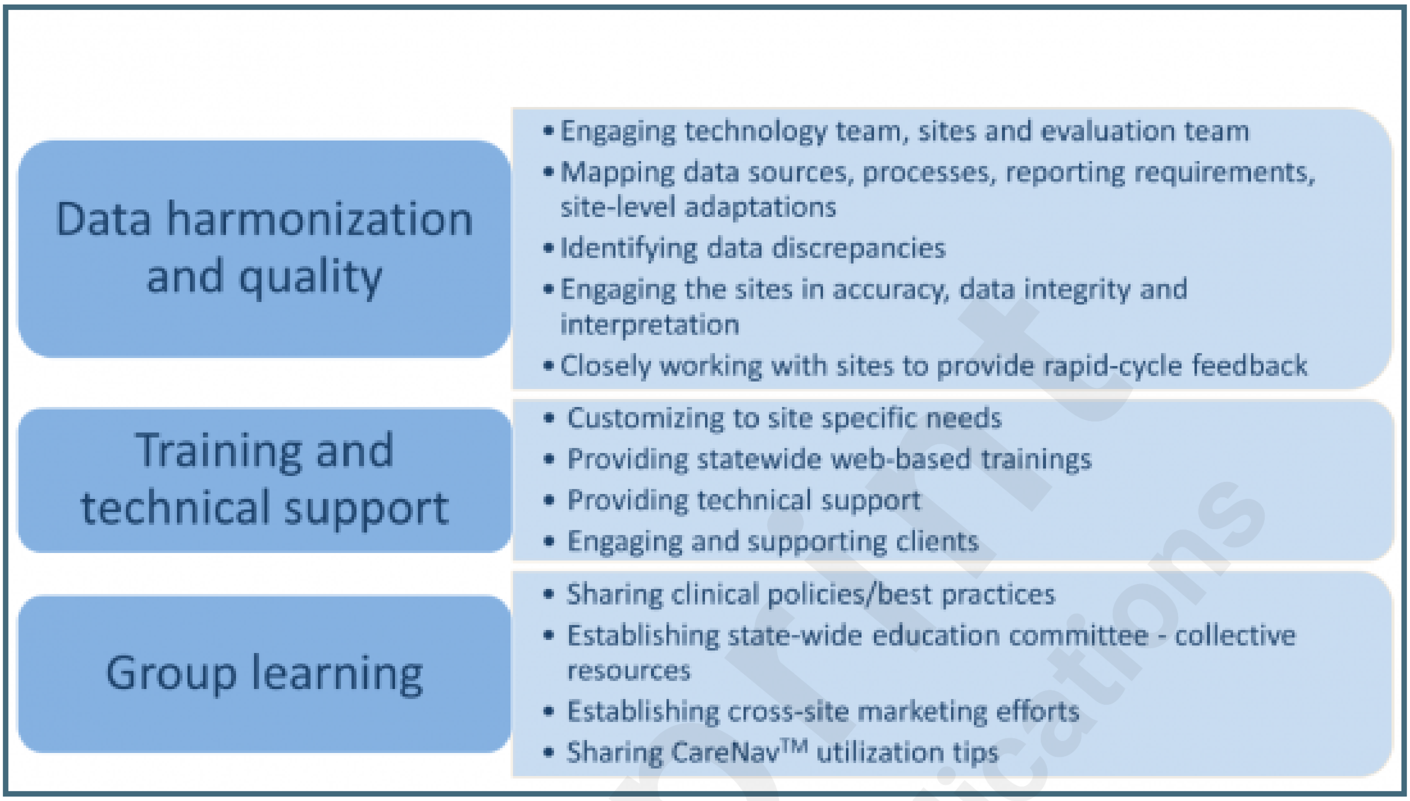
Figures

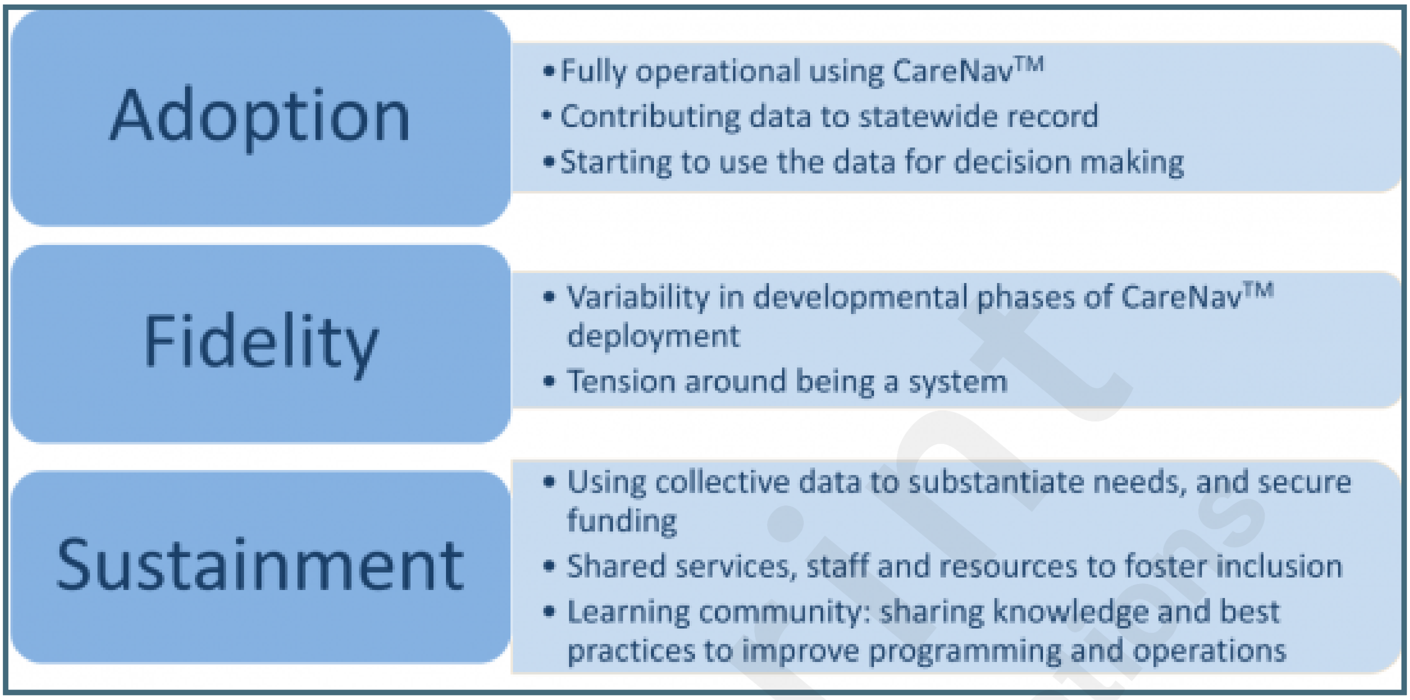
CFIR Outcomes Addendum.



Implementation strategies.



Implementation Outcomes.

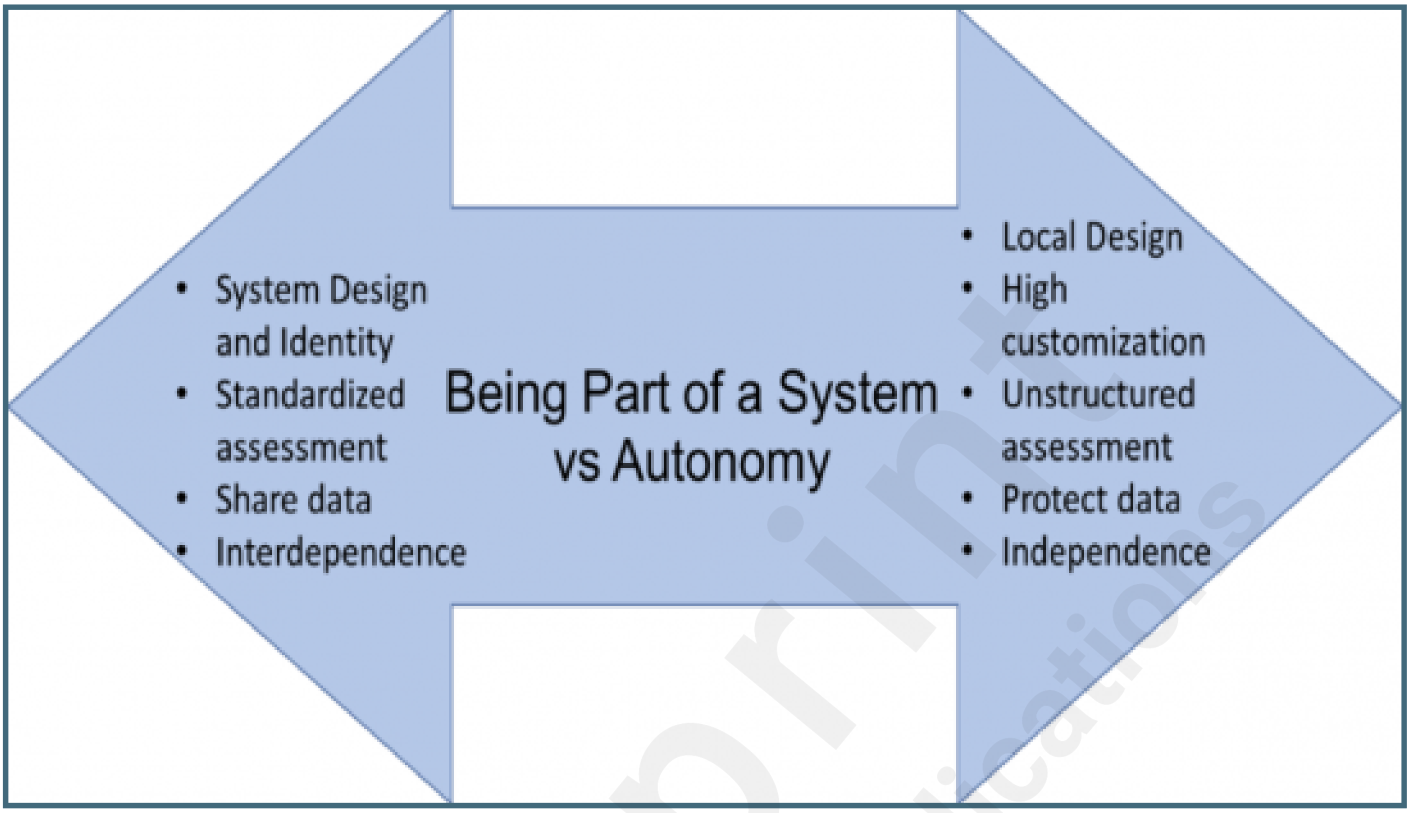


Adoption
- Fully operational using CareNav^{TM}
- Contributing data to statewide record
- Starting to use the data for decision making

Fidelity
- Variability in developmental phases of CareNav^{TM} deployment
- Tension around being a system

Sustainment
- Using collective data to substantiate needs, and secure funding
- Shared services, staff and resources to foster inclusion
- Learning community: sharing knowledge and best practices to improve programming and operations

Tension: Being Part of a System vs. Autonomy.



Population Impact.

Organizational effectiveness and quality

- Real time standardized assessment: better efficiency, identification of needs and tailoring recommendation for clients, and monitoring trends in the caregiving situation
- Reports: systematic monitoring of service quality

Equity

- Better visibility of services
- Targeted outreach and relationship building
- Program refinements to promote inclusion

Caregiver Health and Well-being

- Greater knowledge, capabilities, and confidence
- Better self-care
- Reduced stress